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LVI.—*Report of a Deep-sea Trawling Cruise off the S.W. Coast of Ireland, under the Direction of Rev. W. SPOTSWOOD GREEN, M.A., F.R.G.S.*

[Plates XVIII. & XIX.]

Summary of the Cruise. By Rev. W. S. GREEN.

HAVING for many years been deeply interested in the marine fauna of our southern and western coasts, it was with much pleasure that, at the suggestion of Dr. Günther, I this summer undertook a brief trawling cruise for the purpose of procuring specimens for the British Museum.

Experience gained in three previous cruises to the deep water under the auspices of the Royal Irish Academy, in two of which I was associated with Prof. A. C. Haddon, whose company now and last year I missed sadly, and many years of trawling on the coast, enabled me to calculate fairly on what we were likely to get; so I at once entered into negotiations with the Clyde Shipping Company, and chartered their steamer the 'Flying Fox' for a week's trip, her skipper, Captain Tobin, and his crew being the same I had worked with on former occasions.

Arriving at Queenstown on Friday the 28th of June, I set to work next day fitting the deep-sea gear into the 'Flying Fox.' For this purpose we brought her alongside the Royal Victoria Docks Passage West, where a crane was

available for lowering the heavy iron reels, &c., on board. Some of the gear in my charge belongs to the Science and Art Museum in Dublin, and the Director kindly permitted me to use it on condition that a complete set of duplicate specimens should be sent to Dublin. The gear which we used on the present occasion, and which I have been getting together and improving on for several years, consists chiefly of a deep-sea sounding-machine, made on Sir William Thomson's design, with improvements by Capt. Sigsbee of the U.S. Navy. For this we have two reels with 1400 fath. of steel sounding-wire on each. In deep water a belt connects the machine with the donkey-engine, so that we can haul up by steam. For dredging and trawling we have two reels of steel wire rope; on one is wound 1000 fath. of rope $\frac{7}{8}$ inch circumference, and on the other 500 fath. of $\frac{3}{4}$ inch rope. The donkey-engine had to be slightly altered to heave in this rope, which is wound on to the reels by hand. I have a good assortment of trawls and dredges, and though we took several in case of accidents, the only two we used were an ordinary 20-foot-beam trawl, having a fine-mesh inner lining to the net, and an Agassiz deep-sea trawl, 9-foot beam, and with double foot-ropes. This trawl has not only an inner lining of fine-mesh net, but in 1888 I gave it, with very good results, a second lining of mosquito netting.

A most important consideration in a dredging-expedition off the S.W. corner of Ireland, where the sea is nearly always rough, is to secure the co-operation of helpers possessed of sufficient zeal in the work to make them ignore the discomfort, and who may be proof against the *mal de mer*. This year I was fortunate in securing the help of two gentlemen, Mr. T. H. Poole, C.E., and Mr. W. de V. Kane, who were with me on a former cruise, and Mr. R. Ussher, who now came for the first time.

The work assigned to each was as follows:—Mr. Poole took charge of the soundings and the charting of our cruise, kept the log, and helped at trawling. Mr. Kane's speciality, besides helping at the log, was the preservation of spirit-specimens; and Mr. Ussher, though most especially an ornithologist, was asked to transfer his affections from birds' eggs to "sea eggs," and take charge of the numerous Echinoderms that needed drying and careful packing. Whatever success has crowned our efforts is due in the main to the efficient help I received from these gentlemen, and to that rendered with much enthusiasm by our good captain and crew.

We were most fortunate, too, in the weather. Never before

did we escape without a gale. In 1886, after having our decks swept by the sea, we ran for Valentia, but owing to torrents of rain driven before a fierce south-wester, obscuring all view, we failed to make the lights, and spent a bad night, steaming into the gale till daybreak, off Dingle Bay. In 1888 we were caught in the centre of a cyclone, which veered from S. to N.W., and raised such a sea that one of our paddle-boxes was demolished, and we had to run 75 miles for Beerhaven. This year we had fine weather; the ocean was almost perfectly level, except on one day, when the wind freshened from the eastward and raised a short lumpy sea.

My party joined me on board the 'Flying Fox' at Queens-town on the morning of Monday, July 1, but owing to some delays in completing fittings, it was just noon when we put to sea. On reaching the Fastnet we laid our course by compass W. by S., and, giving orders to have Mr. Poole and myself called about daybreak, we retired early to rest.

STATION I.

At 3.30 A.M., July 2nd, we came on deck, and on hauling the log found that we had run about 71 miles. We sounded at once, and found bottom at 315 fath. As soon as the lead was up, we shot the 20-foot-beam trawl, and veered to it about 600 fath. of rope. We dragged it slowly till 8.30, and then began to haul back. At 9.30 boarded trawl.

The haul was a fairly good one, and contained numerous specimens of Actiniæ, *Actinanga Richardi* being of most frequent occurrence. Of Echinoderms there was a large assortment, *Dorocidaris papillata*, *Pontaster tenuispinis*, *Holothuria tremula*, *Ophiothrix* sp. ? being characteristic.

Hermit-crabs in various species of *Fusus* and *Buccinum*, and, besides animals belonging to many groups which will be duly dealt with in other portions of the report, we had a good take of fish.

While the trawl was being cleared we steamed on our course W. by S.

STATION II.

At 11.30 A.M. the engines were stopped, and a sounding gave a depth of 920 fath. Reeling up of the wire, though done by steam, took a long time, and then wishing to get outside the 1000-fath. line, we steamed on our course till 1 P.M., then shot the 9-foot Agassiz trawl, and veered to it 1450 fath. of rope. At 4.10 we commenced hauling up, and the trawl came on board at 7.10.

The trawl seemed very heavy, and as it approached the surface we could see it looming as a large white object in the clear blue depths. It was half full of *Globigerina*-ooze, so we had to let it wash about and drain for some time at the surface, and then, getting the burton purchase from the mast-head on to it, we drew it on board. Smothered up in the ooze were an immense number of pale purple *Holothurias*, half a dozen specimens of *Calveria*, and various other Echinoderms, including the broken-up arms of *Brisinga*. The ooze was full of the shells of *Hyalæa* and other Pteropods, and there were in it some large Dentaliums.

All day long the sea had been very calm, and Mr. Ussher, aided by various members of the crew, was indefatigable in keeping the surface-nets at work. The surface-waters teemed with Pteropods, *Cleodora lanceolata* being taken in abundance. Masses of *Salpæ* were constantly in sight, and we were fortunate in securing a fine *Carinaria* and one curious little fish (*Argyropelecus*).

By the time the animals were sorted from the ooze, with the help of the fire-hose, darkness had closed in, and a long and successful day's work was concluded. As I did not wish to get into deeper water, we gave orders for the ship being steamed 25 miles E. by S. during the night, and that I should be called at 3.30.

July 3.—At 4 A.M. came on deck; wind fresh from E.; more sea; sounded in 100 fath.; steamed five miles west.

STATION III.

Sounded in 110 fath.; shot beam trawl at 6 A.M.; boarded trawl 9.15 A.M.

The bag had fouled the beam, so the net was empty. In the tangles there were the following:—*Ophiothrix*, *Echinus* two species, *Spatangus Raschi*, and various Echinoderms.

STATION IV.

The sea had risen considerably with the fresh easterly wind. Steamed N. by W. till 11 A.M., then W. for an hour, and shot beam trawl in 250 fath.; boarded trawl at 3 P.M. This proved to be a good haul; amongst Echinoderms a variety of *Echinus* with red spines being specially interesting; and we had a large assortment of fish, *Scorpena*, *Macrurus*, &c. While clearing trawl we steamed west for six miles.

STATION V.

At 4 P.M. we sounded in 650 fath., but considering the

depth too great so late in the day, we retraced our steps and shot the Agassiz trawl in about 500 fath. When it was hauled at 9 P.M. the trawl was found to have fouled, and the rope was badly kinked and tangled.

This closed a very hard day's work, and a blank haul at the end was disheartening. In former years I had paid out our trawl warp over the stern. This year I tried the experiment of dragging the trawl from the bow. In smooth water the plan answered admirably, but in the rough water experienced this day I found that the steamer would not steer going astern, but having a tendency to round to the wind, made it most difficult to pay out the warp without kinks. Before the trawl was clear dark night had closed in.

July 4.—Kept as closely as possible to our position during the night. Longitude $11^{\circ} 36'$ W., Lat. at noon $51^{\circ} 24'$ N.

STATION VI.

Sounded at 5.15 A.M. in 350 fath.; shot Agassiz trawl. Once or twice I noticed an undue strain on the rope, and when the trawl came to the surface at 9, it was found to be all torn to pieces, the irons bent, pulled asunder, and polished like silver. We had evidently fouled rocks.

STATION VII.

Having steamed a few miles S.W., we shot the beam trawl at 10 A.M. in about 500 fath.

Boarded trawl at 1.30; it contained one large boulder weighing about 100 lbs., and several smaller ones, subangular and resembling those of the Boulder Clay. In animal life the haul was rather poor, but there were some interesting corals, worm-tubes, and Echinoderms. Most of the creatures were crushed by the boulders.

Since leaving Queenstown on Monday, most of us had had little or no sleep, so we now steamed off for land, sighting the Skelligs about sunset. We came across a dead and half-decomposed cetacean about 30 feet long floating on the surface of the sea. It was surrounded by a host of blue sharks, which were tearing it to pieces. We succeeded in shooting two, one of which we captured, and then proceeding on our way, let go anchor in Balinskelligs Bay at 10 P.M.

STATION VIII.

Friday, July 5.—Left Balinskelligs Bay at 5 A.M., and at noon shot trawl in 100 fath., 37 miles west of Bull Rock;

boarded trawl at 1.30 P.M. A great haul of Echinoderms and fish; 40 specimens of *Spatangus Raschi*, also a great number of *Echinus microstoma*, *Ophiothrix*, &c.

STATION IX.

Steamed 10 miles west, sounded in 185 fath. Shot trawl at 3.30 P.M.; towed it in a northerly direction; hauled it at 8.30 P.M.; sounded again and found 150 fath.

Holothuria tremula, *Dorocidaris*, and *Spatangus* in multitudes, a dead Madrepora, with every calyx inhabited by a small Ophiuran, giving the appearance of polyps, Cephalopods, Fish, including one dog-fish, eight Macrurids, about a score of flat-fish, &c., were the result of the haul.

When the trawl was up we steamed for the Fastnet.

STATION X.

Passed the Fastnet, and when in 55 fath. south of Jelly Head shot beam trawl at 8.15 A.M., and hauled it at 9.30. This proved a very rich haul in variety of species, amongst which were some splendid specimens of that most striking Echinoderm, *E. Flemingii*, and we obtained also several Actiniæ and Pinnæ. Steamed a few miles east.

STATION XI.

Shot beam trawl at 11 A.M. in same depth as last Station, and with very similar results.

STATION XII.

This, our last haul of the beam trawl, was in 40 fath. off Cork Harbour; the net contained many specimens of familiar forms; and then shaping our course for Queenstown, we landed our gear at 7 P.M.

During our cruise of six days, which included our voyage out and home, we thus made 12 hauls of the trawl. One was spoilt by an unavoidable accident, two by accidents which I ought to have avoided. The other nine gave what I consider to be fair results; and though we missed species which on former occasions we succeeded in obtaining, enough, I hope, has been done to prove the interesting nature of the marine fauna off our south-west coast.

FISHES. By Dr. A. GÜNTHER.

The results of Mr. Green's short cruise in the present year are fresh evidence of the incompleteness of our knowledge of the British Fauna whilst the deep water is allowed to remain unexplored. The importance of undertaking this investigation consists not merely in the addition of a number of unknown forms to our list, but equally and even more in the certainty that many of the mysteries which observations limited to the littoral fauna must for ever leave unexplained will be cleared up by a study of the pelagic and bathybial conditions. Thus the mode and season of propagation of many fishes, their vertical and horizontal distribution, their periodical or casual migrations and their causes, are at present blank chapters in their history, solely because part of their life is spent at a distance from the shallow water of the shore.

Of the eleven species of fishes collected during the present cruise, one (a Sole) has proved to be new to science, and five are new to the British Fauna; unknown facts with regard to the propagation of *Chimæra* have been ascertained; and of all exact data as to their bathymetrical range have been obtained. It is a singular fact that the five species new to the Fauna are species well known from more southern latitudes, from Madeira and the Mediterranean. Those who have perused my report on the Fishes collected by Mr. John Murray in deep water (50–100 fath.) on the west coast of Scotland, may recollect that the more characteristic forms, with few exceptions, were members of the northern or even arctic fauna. Whether this faunistic difference is due to the slight difference in latitude (six degrees), or to the circumstance that the Scotch fishes were collected at a considerably lesser depth, I am unable to decide at present.

The fishes collected are the following:—

Pristiurus melanostomus, Raf.

A young specimen from 150 fath. Collett had obtained the same species at Tromsö from a depth of 250 fath.

Chimæra monstrosa, L.

The egg-capsule of *Chimæra* was previously unknown; that figured by Joh. Müller (Abhandl. Berl. Ak. 1840, taf. 6. fig. 3) and by Duméril (Hist. Nat. Poiss. i. pl. 8. fig. 8) is that of *Callorhynchus*, and not of *Chimæra*. Mr. Green obtained one at 315 fath.

The whole capsule is $6\frac{1}{2}$ inches long, and consists of a

broader anterior portion containing the body of the embryo, and gradually tapering into a styliform posterior portion for the reception of the tail. The anterior portion is of an elongate ovate shape, a little broader in its dorso-ventral* diameter than in the transverse. Anteriorly the capsule is flattened and truncate, open in front as well as on the sides, but the two flaps fitting closely into each other, so that nothing but water is admitted. The styliform portion is provided with four narrow ridges, of which the strongest is that of the right side, extending nearly from one end of the capsule to the other, whilst the corresponding ridge of the left side disappears on the broad portion of the capsule. The dorsal and ventral ridges are much thinner, fragile, and show a rayed structure. The outer surface of the capsule is perfectly smooth.

The discovery of this egg-capsule has enabled me also to determine a similar object from Japan which has been in my possession for several years. In shape it agrees entirely with the Atlantic form, but it is considerably larger, measuring 9 inches, and has its surface finely ribbed longitudinally and

* This term is used in relation to the position of the embryo within the capsule, which, on opening the broad face of the egg in *Callorhynchus* as well as in *Chimæra*, is found to lie on its side.



a and *b*, transverse sections at the places indicated by a cross (x).

transversely. This is evidently the egg-capsule of the Japanese *Chimæra* which has been hitherto considered identical with *C. monstrosa*.

In the 'Challenger' report on Deep Sea Fishes (p. 13) I have already mentioned that *Chimæra* most probably propagates in deep water. This is now confirmed by the discovery of its egg in 300 fath. The capsule has no filaments for adhesion; they would be useless at a depth where the water is perfectly quiet. Probably the eggs simply lie on the ground or are implanted in the ooze by their styliform end.

Scorpena dactyloptera, de la Roche.

Several specimens, from 250 fath.

New to the British fauna. Common in the Mediterranean and at Madeira, where Lowe found it in 250–400 fath.; and not uncommon on the coast of Norway, in depths of from 100–300 fath.

Hoplostethus mediterraneum, C. V.

One specimen, from 250 fath.

New to the British fauna. Hitherto found at considerable depths (no precise statements are available) in the Mediterranean, at Madeira, off Chesapeake Bay, and on the coast of Japan. The size of the scales varies conspicuously in specimens from the same locality.

Capros aper, L.

One specimen, from 180 fath.

The Boar Fish, which at irregular intervals appears on the coast in large numbers, seems to inhabit the deep water along the whole of the south and south-western coasts.

Phycis blennioides, Brünn.

One specimen, from 150 fath.

The Forked Beard was previously reported by Strom and Collett from a depth of from 70 to 200 fath. on the Norwegian coast.

Macrurus cælorhynchus, Risso.

Several specimens, from 250 fath.

New to the British fauna. Not uncommon in the Mediterranean, where it was discovered by Risso at a similar depth, and at Madeira. Collett thinks that he has observed also a specimen near Bergen.

Macrurus laevis, Lowe.

Several specimens, from 250 fath.

New to the British fauna. Not uncommon in the Mediterranean and at Madeira; a single example is known to have been obtained on the coast of Denmark (*Lütken*), one at Bohuslän (*Malm*), and another off the coast of Pernambuco ('*Challenger*').

Rhombus Boscii, Risso.

Several specimens, from 150 and 315 fath.

New to the British fauna. This species, originally discovered in the Mediterranean, was, probably owing to the small size or condition of the specimens, inaccurately described and figured by Risso, Bonaparte, and Canestrini. The scales were represented much too large, and the notes on the dentition were vague. Hence it was referred by myself to the genus *Arnoglossus* at a time when no specimens were available for examination (Fish. iv. p. 416), but there was sufficient evidence of its being a very distinct species from any of the Flat-fishes known to inhabit the British Seas. Nevertheless we find it in the 'Fishes of Great Britain' by F. Day (who seems to have followed Giglioli) relegated to the synonymy of *Rhombus megastoma*, an error which in 1883 was corrected by Vinciguerra*, and in 1887 by Kolombatović†, both of whom clearly pointed out the distinctive characters of these two species.

Rhombus Boscii may be recognized at the first glance by its enormous eyes, which are much larger than in *Rhombus megastoma*, as may be seen from the following measurements:—

	<i>R. megastoma.</i>	<i>R. Boscii.</i>
	lines.	lines.
Total length. . . .	198	170
Length of head. . . .	50	46
Length of osseous orbit	11	15
Length of snout . . .	15	11

Rhombus megastoma never has the large black spots on the dorsal and anal fins which are so conspicuous a feature in *R. Boscii*, although they may also disappear in specimens of the latter species if they have been allowed to get stale before they are placed in spirits. The vomerine teeth are present

* Vinciguerra, Ann. Mus. Civ. xviii. 1883, p. 570.

† G. Kolombatović, Sui *Pleuronectes Boscii* e *megastoma*. Spalato, 1887. 8vo.

I am also indebted to the Marquis G. Doria for kindly communicating to me specimens of both species from the Gulf of Genoa, and to Professors Doderlein and Bellotti for specimens of *R. Boscii* from Palermo and Nice.

in both species, which therefore ought to be removed from the genus *Arnoglossus*.

In the British seas both species occur, but, so far as we know at present, *R. megastoma* does not go the same depth as *R. Boscii*, but extends further northwards.

I subjoin a full description of *Rhombus Boscii*.

D. 80-81. A. 63-65. L. lat. 85.

The height of the body is two fifths of the total length (without caudal), the length of the head nearly one third; scales rather small, with the posterior margin ciliated, truncated or rounded, covering nearly the whole head, the interorbital space and the maxillary included; interorbital space extremely narrow; the diameter of the eye is one third of the length of the head. Lateral line with a sub-semicircular curve above the pectoral fin. Lower jaw prominent; maxillary nearly one half of the length of the head. The teeth in the jaws form narrow bands; vomerine teeth in small number (two or three) implanted somewhat behind the front margin of the vomer. The lower eye a little in advance of the upper. The dorsal fin terminates at a distance from the caudal which is somewhat less than the depth of the free portion of the tail; its longest rays are at the commencement of the posterior third of the fin, where they are two fifths of the length of the head, and rather shorter than the pectoral. No spine before the anal. Body very light coloured, without spots; two large rounded deep black spots occupy the posterior portion of the dorsal and anal fins.

The largest specimen obtained is 14 inches long, the smallest about half that size.

Solea variegata, Flem.

One specimen, from 150 fath.

Solea Greenii, sp. n.

D. 81. A. 65. P. dextr. 5. P. sin. 1. L. lat. 144.

This species is very elongate, its greatest width being one third of the total length (without caudal); the length of the head is contained five and a half times in the total length. The shape of the head resembles very much that of the Common Sole. The eyes are of medium size, about as long as the snout and one fifth of the length of the head; the width of the interorbital space equals the vertical diameter of the eye. None of the nostrils dilated, that in front of the lower eye being prolonged into a short tube; the vertical fins are rather low and covered with

scales. The right pectoral very small, about as long as the eye; the left pectoral is reduced to a minute ray. The ventrals, also, are small, but the extremities of their middle rays extend backwards to the anal fin. The dorsal and anal terminate immediately in front of the caudal. Scales of both sides ctenoid, more so on the coloured than on the blind side. Coloration uniform grey.

This species is distinguished by characters which bring it near to *Solea vulgaris* as well as to *Solea variegata*. From the former it is separated by the rudimentary structure of its pectoral fins, from the latter by the number of its fin-rays, by its much smaller scales, and by its coloration. Unfortunately only one specimen was obtained, nearly 6 inches long, at a depth of 150 fathoms. It is in a perfect state of preservation.

MOLLUSCA. By EDGAR A. SMITH.

Of the twenty-four species enumerated in the following list, nearly all were obtained by the 'Porcupine' expedition off the west coast of Ireland or in other parts of the North Atlantic, and have been recorded by Jeffreys in his series of Reports in the Proc. Zool. Soc. 1878, 1879, 1881-85. It would therefore be of little use now to give references and distribution in full, which may be obtained by consulting the papers referred to. The collection only affords slight additional evidence with regard to geographical and bathymetrical considerations.

The fine *Dentalium* and *Sipho*, the *Lyonsiella*, and the new *Cuspidaria* are perhaps the most interesting of the additions to the Museum collection.

CEPHALOPODA.

Rossia Owenii, Ball.

From 150 to 200 fath.

Rossia sublaevis, Verrill.

From 250 fath.

Eledone cirrosa, Lamarek.

From 150 fath.

PTEROPODA.

Peracle diversa, Monterosato.

Dead shells dredged in 1000 fath.

No full description of this species has yet appeared; indeed all the information respecting it which has been given is that it differs from *Peracle reticulata*, d'Orb., in having a shorter spire and a deeper and denticulate suture. To these distinguishing characters may be added that of the columella being surrounded by a *double* keel instead of a single one as in *P. reticulata*. The surface of fresh specimens has the same epidermal reticulation in both species.

I have not yet had an opportunity of examining the types of Pelseneer's *P. bispinosa*, but I have a strong suspicion that it is the same as *P. diversa*. Still, as no reference is made to the keel which circumscribes the columella (nor is it depicted in the figure), I must refrain from expressing a positive opinion.

Cavolinia (Diacria) trispinosa, Lesueur.

Dead shells in from 250 to 1000 fath.

GASTROPODA.

Buccinum undatum, var.

From 55 fath.

The single young specimen, about an inch long, is peculiarly fusiform, whitish, without colour-markings, and clothed with a delicate fibrous epidermis. Only the feeblest indication of oblique plication is discernible. Adult specimens of this variety were obtained by the 'Porcupine' expedition off the south of Ireland in 113 and 180 fath., and off the west coast in 90 and 159 fath.

Sipho (Siphonorbis) fusiformis, Broderip.

From 110 fath.

The single specimen obtained is very fine, and considerably exceeds the dimensions usually assigned to this shell. Its total length is 52 millimetres; aperture 23.

The 'Porcupine' expedition obtained examples off the west and south of Ireland in from 90 to 725 fath. The species occurs in deep water off the Norwegian coast, and was also dredged by the 'Travailleur' north of Spain in from 277 to 731 fath. (*Jeffreys, MSS.*).

Columbella (Anachis) haliweti, Jeffreys.

From 1000 fath.

Bulla semilævis, Seguenza.

From 1000 fath.

Cylichna (Sao) ovata, Jeffreys.

From 1000 fath.

This species was obtained in various parts of the North and West Atlantic in from 350 to 1000 fath. by the 'Porcupine' and 'Challenger' expeditions.

SCAPHOPODA.

Dentalium candidum, Jeffreys.

From 1000 fathoms.

One of the two specimens obtained is very fine, and considerably exceeds the dimensions quoted by Jeffreys. It is 85 millimetres in length (= $3\frac{3}{8}$ inches), and 8 in diameter at the aperture. The longitudinal striæ in this example can be traced from the apex along about half the length; and at a little more than an inch from the broader extremity a strongly marked reparation of an injury is visible, the result of an accident or the attack of an enemy.

This species was first obtained by the 'Valorous' expedition in from 410 to 1750 fath.; it was subsequently dredged at several stations off the west and south of Ireland by the 'Porcupine' expedition at depths ranging from 420 to 2435 fath.

Cadulus Olivi, Scacchi.

From 1000 fath.

Two specimens from the above depth agree exactly with others in the Museum obtained by the 'Porcupine' expedition, which Jeffreys* associated (and probably correctly) with this species. The latter were dredged off the west of Ireland in 1230 fath., and south of Ireland in 539 fath.

PELECYPODA.

Montacuta substriata, Montagu.

From 50-60 fath.

As usual around the British coasts, these specimens were dredged attached to the spines of *Spatangus purpureus*.

* Proc. Zool. Soc. 1882, p. 663. Remarks on distribution and synonymy are also given.

Cardium echinatum, Linné.

From 55 fath.

One young specimen, 10 millim. in length.

Cardium minimum, Philippi.

From 1000 fath.

One example only.

Lyonsiella gemma, Verrill.

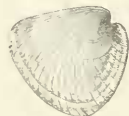
Lyonsiella gemma, Verrill, Proc. U.S. Nat. Mus. 1880, vol. iii. p. 396; Dall, Bull. Mus. Comp. Zool. Harvard, vol. xii. p. 288; Smith, 'Challenger' Lamellibranchiata, p. 166.

From 1000 fath.

One perfect right valve was obtained.

Verrill's locality was off the east coast of the United States in 487 fath.

I cannot reconcile Verrill's description with the *Pecchiolia insculpta* of Jeffreys, with which it has been united by Dall (*l. c. supra*). The form appears to be quite different. In *L. insculpta* the anterior end is narrowed, the posterior obliquely arcuate and broad. On the contrary *L. gemma* is "broadly rounded anteriorly," and has the "posterior end short, narrowed, and tapered to an obtuse point"—terms exactly applicable to the single valve at hand.



On comparison with a 'Porcupine' example of *L. insculpta*, which very closely resembles the figure in the Proc. Zool. Soc. 1881, pl. lxx. fig. 4, the texture and surface ornamentation are seen to be identical, excepting that there are two or three extra radii.

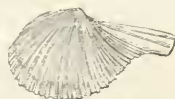
When extensive series of these two forms are available, their outline may prove very variable and of little specific importance. This I think is very likely to be the case.

Verticordia subquadrata, Jeffr.

From 1000 fath.

Cuspidaria (Cardiomya) Greenii, sp. n.

Shell small, fragile, subpellucid, narrowly rostrate posteriorly; ventral outline regularly curved, but finely dentate by the terminations of the radiating ribs; dorsal margin on both sides of the beaks straight, subhorizontal, anterior portion very short; anterior outline of the valves oblique, slightly arcuate; radiating costellæ about 30, those



just in front of the central part stronger than those down the anterior side and the few upon the rostrum, which is truncate at the end and well marked off from the rest of the shell by a conspicuous contraction in the lower margin. Length 7, height $3\frac{2}{3}$ millim.

From 1000 fath.

Only a single specimen of this species was obtained. It is peculiar for the straightness of the hinge-line. In this respect, to some extent, it resembles the figure of *Cardiomya perrostrata*, Dall (Bull. Mus. Comp. Zool. Harvard, vol. xii. pl. ii. figs. 3 a, 3 b). That species, however, is distinguished by a somewhat longer rostrum, and the main portion of its valves is more globular.

Nuculana pusio (Philippi)?

From 1000 fath.

Several specimens from this locality I cannot distinguish from others obtained by the 'Porcupine' expedition, which were named *Leda pusio* of Philippi by Jeffreys. With this determination, however, I am not at all satisfied, for both the description and figure of Philippi indicate a shell of a considerably different form. I have not had an opportunity of seeing fossil examples, upon which the species was founded, and therefore hesitate to separate the recent specimens as a distinct species.

I feel compelled to adopt the generic term *Nuculana* notwithstanding the observations of Mr. Dall*.

Mörch† in his paper "On the genera of Mollusca established by H. F. Link," arrived at a similar conclusion.

Dall has translated "Die Schalen gleich, schliessen überall" (part of Link's diagnosis) thus: "shell smooth, closed all round," and states that this "will not apply to the group separated by Schumacher, afterwards, under the name of *Leda*." The correct rendering of the above sentence I believe should be *the valves equal (or alike) closed all round* ‡, terms which *do* apply to the only species quoted by the author, namely, *N. rostrata*, which is synonymous with *N. pernula* of Müller, under which name this species is now usually known.

As *Nuculana* has some years precedence over *Leda*, in Mr. Dall's words, it "must necessarily be adopted. The longer an untenable name is retained, the more inconvenience

* Bull. Mus. Comp. Zool. 1886, vol. xii. p. 245.

† Proc. Zool. Soc. Lond. 1862, p. 228.

‡ It is not probable that notice was taken of the very slight chink at the end of the rostrum.

results to science when it is, as it always will be, eventually overthrown."

Nuculana pustulosa, Jeffreys.

From 1000 fath.

Nucula reticulata, Jeffreys.

From 1000 fath.

Nucula corbuloides, Seguenza.

From 1000 fath.

This and the preceding species were both taken in deep water off the west of Ireland by the 'Porcupine' expedition.

Limopsis cristata, Jeffreys.

From 1000 fath.

Lima (Limatula) subovata, Jeffreys.

From 1000 fath. One valve only.

This species was dredged by the 'Valorous,' 'Porcupine,' and 'Challenger' expeditions at various stations in the Atlantic and the Mediterranean, and according to Jeffreys very fine examples were obtained by the Norwegian and Dutch Arctic Expeditions.

CRUSTACEA. By R. I. Pocock.

Although not extensive in numbers this collection is of considerable interest, inasmuch as it adds several forms to the Crustacean fauna of Great Britain.

Of course many of the specimens obtained are referable to species of common occurrence on our coasts, but I am not aware that such forms as *Anamathia Carpenteri*, *Lispognathus Thomsoni*, and *Parapagurus pilosimanus* have ere this gained the right to be included in a list of the fauna of the British area. Two species only are now for the first time characterized. One of these, *Ebalia nux*, has long been known from the Mediterranean under a manuscript name; the other *Eupagurus carneus*, appears to be wholly new.

DECAPODA.

Anamathia Carpenteri.

Anamathia Carpenteri, Norman, in Wyville Thomson's 'Depths of the Sea,' p. 175, fig. 35 (1873).

Anamathia Carpenteri, S. I. Smith, Report on Decapoda of Albatross dredgings, Washington, 1886, pp. 21, 22.

Several specimens from depths of 110 and 250 fath.

Lispognathus Thomsoni.

Dorhynchus Thomsoni, Norman, in Wyville Thomson's 'Depths of the Sea,' p. 174, fig. 34 (1873).

Lispognathus Thomsoni, A. M.-Edwards, Comptes Rendus, pp. 878-932 (1881); Miers, Brachyura of 'Challenger,' p. 28, pl. v. fig. 2.

Specimens were obtained at a depth of 250 fath.

Hyas coarctatus, Leach.

A specimen from 250 fath.

Eurynome aspera, Leach.

Two specimens from 315 fath.

Ebalia nux, sp. n.

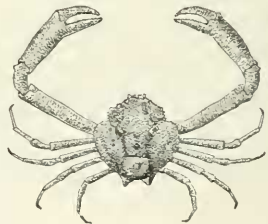
Ebalia nux, Norman, MS.

Carapace as broad as it is long, entirely covered with rounded tubercles, convex from before backwards and from side to side, the regions well defined; the frontal region horizontal or slightly upturned, with somewhat sharply emarginate anterior edge; posterior gastric region marked with larger tubercles—two anterior and paired, and one or two posterior and median; intestinal region armed with a large tubercle above and with sharply emarginate hinder edge; lateral surface of carapace much more finely granular than the superior surface.

Chelipedes long in males, short in females, covered thickly with larger and smaller granules; merus almost cylindrical; propodus thicker at its distal than at its proximal end; dactylus gently curved and slightly inturned, widely separated at the base in the adult males, in contact in the females.

Legs granular above and below.

Abdomen in the male triangular, with the third and fourth segments fused together, with a median projection on the hinder margin of the terminal segment; in the female covering the whole sternal surface of the cephalothorax, with the



Ebalia nux, ♂, nat. size.

third, fourth, and fifth segments fused, the sixth very small and imbedded in an excavation at the base of the external maxillipedes.

♂. Length and width of carapace 11 millim.; length of chelipede 25 millim.

♀. Length and width of carapace 10 millim.; length of chelipede 14.

A number of specimens of this species were dredged by the 'Porcupine' in the Mediterranean. Some of these specimens were presented to the British Museum by the Rev. A. M. Norman and were labelled "*E. nux*, Norm." This name is included in the list of the species composing the Museum Normanianum, and also in the list of the species of *Ebalia* given by Mr. Miers in his Report on the Brachyura of the 'Challenger.' But no description of the species has yet been published. I have consequently taken this opportunity of characterizing it and have selected as types an adult male and female specimen belonging to the series dredged in the Mediterranean. In some of the small specimens of this series the larger tubercles on the gastric region of the cephalothorax are wholly absent.

A single damaged male specimen was obtained by Mr. Green at a depth of 315 fathoms. This specimen differs from all the Mediterranean forms that I have seen in having the legs almost wholly smooth.

Munida bamffica (Pennant).

Two specimens from 250 or 315 fath.

Although Prof. G. O. Sars has attempted to show that *M. Rondeletii* is specifically distinct from *M. rugosa*, nevertheless I agree with my friend Mr. A. O. Walker in thinking that the two names must be referred to one and the same species, which, in accordance with the laws of priority, must be termed *M. bamffica*, Pennant.

Eupagurus bernhardus (Linn.).

For synonyms and distribution of this and the following two species of *Eupagurus*, see Henderson, "A Synopsis of the British *Paguridae*," Proc. Phys. Soc. Edinb. 1886, p. 65.

One specimen from 55 fath.

Common in the North Atlantic.

Eupagurus pubescens (Kröyer).

Eupagurus pubescens (Kröyer), Henderson, loc. cit. p. 71.

One specimen from 200 fath.

Common in the North Atlantic.

Eupagurus excavatus (Herbst).*Eupagurus excavatus* (Herbst), Henderson, loc. cit. p. 70.

Two specimens from 110 fath.

Taken on the west coast of Ireland by the 'Porcupine' expedition, and ranging from Senegambia to the Shetlands.

Eupagurus carneus, sp. n.

Carapace with posterior and lateral portions membranous; anterior portion smooth, slightly convex from before backwards, more so from side to side, the median frontal projection well marked and sharp, the lateral less marked than the median and each tipped with a minute spine.

Ophthalmopods stout, with dilated corneæ and small tufts of hairs, projecting slightly beyond the second segment of the antennular and antennal peduncles; the scale small, narrow, and spatulate, being hollowed out above and bearing a small forwardly directed tooth below.

Antennæ. Basal segment bearing distally one spine on the upper inner margin, a second slightly longer on the inferior surface and externally, and a third very large one which, superiorly denticulate, extends as far as the distal end of the second segment; acicle slender and outwardly curved, projecting to about the middle of the distal segment of the peduncle; the whole of the peduncle more or less hairy.

Chelipedes very unequal in size, the right being much larger than the left. In the right the *merus* is trigonal, with convex internal and external surfaces; the external surface squamate, internal surface almost smooth; the external edge of the lower surface is finely denticulated, and prolonged in front into a spine; the internal edge of the lower surface bears proximally two larger blunt teeth; the anterior edge of the upper surface bears about five separated sharp teeth. The *carpus* is large, being longer than the greatest length of the *merus* by about one third of its own length; the upper surface slightly convex from before backwards and from side to side, proximally a little squamate, but the rest of the surface thickly covered with exceedingly minute close-set granules; the external and internal margins of this surface very well marked; the external margin slightly raised, denticulated in the middle, and gradually converging towards the meral articulation; the internal margin much more strongly marked, dentate throughout its extent, and abruptly converging towards the meral articulation; external surface more coarsely granular than the superior surface, and armed in front with a few small denticles; the inferior surface

internally squamate; internal surface finely granular, with sharply raised and very obscurely denticulated anterior margin. Upper surface of *manus* convex from before backwards and from side to side, much dilated externally, and



Eupagurus carneus, ♀, nat. size.

covered with exceedingly minute close-set granules; its inner and outer edge much compressed and denticulated throughout their extent; inferior surface of the hand also covered with minute granules, but these are less close-set than upon the superior surface. Upper surface of *dactylus* also finely granular, its external edge compressed, finely dentate, as is the corresponding edge of the hand, and not evenly convex but distinctly sinuate; inferior surface of *dactylus* smooth, shining, and sparsely punctate, as is the corresponding prolongation of the *manus*.

Left chelipede. *Merus* somewhat resembling that of the right, but more hairy, and without the teeth above in front. *Carpus* with two parallel rows of strong teeth above; its inner surface smooth in parts, and bearing two teeth in

front; its inferior surface squamate; its external surface granular, produced in front below into a bi- or tridentate lobe and above into a single sharp tooth; the upper surface armed between the two series of teeth with a single bifid tooth. *Manus*: upper surface bearing a large denticulated keel, which runs from the middle of the posterior margin to the extremity of the dactylar prolongation of the manus; externally and internally to this keel, except internally on the surface of the dactylar prolongation, where it is smooth, the upper surface is very finely and closely granular, and the external and internal margins are obscurely denticulate; the inferior surface is rounded, smooth, and sparsely but deeply punctured, and sparsely hairy. *Dactylus* smooth above and below, and furnished with small tufts of hairs.

Ambulatory limbs externally and internally smooth; in the first pair the merus is spiny beneath, and the carpus and propodus spiny above; in the second pair the carpus is spiny above and the propodus obscurely so; dactyli considerably longer than the propodi, and curved.

The penultimate abdominal tergite is marked by a median transverse constriction.

Colour (in spirit). The cephalothorax dirty white, with a patch of red on each side of the anterior portion; reddish tints about the bases of the ophthalmopods; the appendages pale pink, paler towards their distal extremities, and with darker patches here and there.

Measurements (in millimetres). Length of carapace $15\frac{1}{2}$; right chelipede—length of merus 9.10, of carpus 14, width of carpus 9; length of manus (to articulation of dactylus) 9, width of manus $10\frac{1}{2}$; length of dactylus 9.

Two female specimens, in shells of *Chrysodomus gracilis* and *Sipho despectus*, at depths of 110 and 315 fath.

Parapagurus pilosimanus.

Parapagurus pilosimanus, S. I. Smith, Trans. Conn. Acad. v. p. 51 (1879); id. Bull. Mus. Comp. Zool. x. p. 20, pl. ii. fig. 4 (1882).

Specimens, associated with *Epizoanthus*, from 315 to 1000 fath.

This species is abundant on the N.-American side of the Atlantic, and was obtained by the 'Albatross' at a depth exceeding 2000 fath. I am not aware that its occurrence within the limits of the so-called British area has been reported before.

Pandalus annulicornis, Leach.

Two specimens, at 55 and 250 or 315 fath.

AMPHIPODA.

? *Metopa Bruzelii* (Goës).

Metopa Bruzelii, Boeck, Skand. Arkt. Amph. p. 458, pl. xviii. fig. 2.

Three damaged specimens, which appear to be referable to this Arctic species, were taken in 55 fath. of water.

Callisoma crenata.

Callisoma crenata, Sp. Bate, Cat. Amph. Brit. Mus. p. 85, pl. xiv. fig. 5; id. Brit. Sessile-eyed Crust. i. p. 126; Boeck, loc. cit. p. 132, pl. vii. fig. 1.

One specimen, at a depth of 55 fath.

This specimen has been compared with the type, which is preserved in the collection of the British Museum.

Amphithopsis latipes.

Amphithoe latipes, Sars, Overs. Norsk.-Arct. Region Krebsdyr, p. 20.
Amphithopsis latipes, Boeck, loc. cit. p. 355, pl. xxii. fig. 4.

Several specimens, 55 fath.

I have compared these specimens with the type of *Calliope Ossiani* (Sp. Bate), and I find that they agree with it in all respects. But, according to Boeck, *Calliope Ossiani* is synonymous with *Amphithopsis latipes*.

Phronima sedentaria.

Cancer sedentarius, Forskål, Descript. Anim. p. 95.

Phronima sedentaria, Latr. Gen. Crust. et Ins. i. p. 56, pl. ii. fig. 2; Sp. Bate, Brit. Sessile-eyed Crust. ii. p. 23; Stebbing, Amphip. 'Challenger,' ii. p. 1357, pl. clxii. B.

A single specimen, associated with a *Beroe*, came up in the trawl 80 miles from land.

PANTOPODA.

Pycnogonum littorale (Ström).

For the literature of this species, and remarks on its distribution, see 'Report on the Pycnogonidea of the Challenger,' by Dr. Hoek, p. 99.

A single specimen, depth?

ECHINODERMATA.

By F. JEFFREY BELL, M.A., Sec.R.M.S.

[Plates XVIII. & XIX.]

The collection of Echinoderms made by Mr. Green is of very great interest and importance; it contains several excellent specimens of *Phormosoma placenta*, the type of which seems to be lost, and was, as Wyville Thomson reports, imperfect. The species of *Echinus* present, as may be expected, considerable difficulty, and it is clear that much to be said with regard to them must be considered as tentative; the range of variation exhibited by *Spatangus Raschi* is enormous, and the possibility of hybrids existing between it and *S. purpureus* will have to be borne in mind. *Asterias rubens* comes from 100 fathoms, a greater depth than any yet recorded; for the first time we are able to enumerate among the British deep-sea Echinoderms a species of the genus which Mr. W. Percy Sladen has lately described under the name of *Nymphaster*; *Astrogonium* is represented by a new species taken at 1000 fathoms, and there is an excellent series of *Astropectens*. There is a remarkable form from the same great depths which appears to be allied to *Hymenaster*; but I think it well to postpone an account of it till I am able to compare it with those described by Mr. Sladen, which will, I hope, shortly find their resting-place in the National Collection. I propose in like manner to defer an account of a remarkable Ophiurid till I have had under my eyes the *Ophiobyrsa hystricis* which was described some time since by Mr. Lyman, but which has not yet been deposited in the Museum; our specimen, which is unfortunately both unique and dry, agrees exactly with Wyville Thomson's description of "a very large Ophiurid with thick arms, upwards of 3 decimetres long, and a large soft disk resembling that of *Ophiomyxa*, to which genus it seems to be allied;"* but it does not correspond at all with another *Ophiobyrsa*, viz. *O. rudis*.

I must not conclude these introductory remarks without giving expression to the opinion that one of the most necessary pieces of work now to be done in marine zoology is the investigation of the deep-sea fauna of the south-west coast of Ireland.

A. PELMATOZOA.**I. CRINOIDEA.***Antedon bifida*, Penn.*Antedon rosacea*, auct.

In the present state of our knowledge I must refer to this

* 'Depths of the Sea,' p. 124.

species two specimens from 250 fathoms. Dr. H. Carpenter intends to investigate the limits of this species; it will, I think, be contrary to what usually happens when questions of this kind are closely studied if he should be led to any other conclusion than that we have here to do with what may justly be called a protean species. The depth recorded is greater than any yet given by 150 fathoms.

Antedon phalangiium, J. Müller.

A single specimen from 250 fath. Dr. H. Carpenter gives 30-220 fath. as the bathymetrical range of the species. Mr. Green's dredging therefore slightly increases the range.

B. ECHINOZOA.

II. ASTEROIDEA.

Pontaster tenuispinis, Düb. & Kor.

Of this common species several specimens were sent from 315 fath.; "many" were also dredged at ? 250 fath. The finest specimens are unfortunately a good deal injured; but a good series was got, as some of the specimens are quite young.

Astropecten irregularis, Penn.

A number of specimens from various depths, 250, 500, and 1000 fath. The species is so variable that it would be unsafe to regard the arrangement of spines, proportion and number of marginal plates, and so on in these examples as in any way characteristic of deep-sea forms. I cannot, indeed, see any special points in them; but the depths are noteworthy, as Mr. Sladen has none greater than 374 fath.

Luidia ciliaris, Phil.

Two specimens, from 55 fath.

Astrogonium Greeni. (Pl. XIX. fig. 4.)

$$R = 27, r = 12.5.$$

The curve between the arms is well rounded; there are seven or eight superomarginal and seven to nine inferomarginal plates; those of the upper and lower series do not correspond regularly; the innermost are longer than wide, one or two about the middle of the row tend to be square, and the more external are wider than long; the terminal superomarginal

plate is elongated, and the more so when there are seven than when there are eight plates, while the terminal inferomarginal plate is triangular. The abactinal plates of the disk are uniformly granulated and are irregular in shape, with a not very well-marked tendency to be hexagonal in form. The ultimate, and sometimes also the penultimate, superomarginal of either side of each arm is not separated from its fellow by any of the abactinal plates.

The granules of the plates of the actinal are somewhat coarser than those of the abactinal surface; on each side of the middle line of the arm there are two rows of plates, one of which extends to the end of the arm and the other halfway. The adambulacral spines are short and square at their tip, so that they differ hardly at all from the granules of the adjacent plates; they are arranged in a single row, and there appear to be ordinarily five on each adambulacral plate. The groove is exceedingly narrow and the tube-feet are not to be seen in the single specimen collected. There are no signs of any pedicellariæ, and there are no spines. The madreporite is undistinguishable. The appearance of the specimen in alcohol is somewhat leathery, owing to the comparatively thick membrane with which it is invested.

Dredged at 1000 fath.

I have particularly compared this new species with the description of *Stephanaster Bourgeti**, Perrier, which Mr. Sladen has lately transferred to the genus *Astrogonium* and which was dredged off St. Vincent and the Cape-Verde Islands at 189-317 fath.; but the difference in the proportion of the greater and less rays, the larger number and different form of the marginal plates, and the absence of the remarkable pedicellariæ in our species are quite sufficient to show that there is no close relationship between these two forms.

Nymphaster protentus.

Nymphaster protentus, Sladen, Chall. Rep. Ast. p. 303.

Five specimens, one quadriradiate, from 315 fath.

I was at first inclined to regard these as examples of a new species; but a careful examination shows that they vary a good deal among themselves, and a more careful study of Mr. Sladen's description leads me to the conclusion that it is a *specimen* and not a *species* which he has described. As the 'Challenger' collection of Asteroids has not yet been deposited in its future home, the British Museum, I have had to content myself with the description and figures.

* Ann. Sci. Nat. xix. (1885), art. 8, p. 31.

This species, now for the first time recorded from the British seas, is here represented by specimens all larger than Mr. Sladen's type, for the smallest has the greater radius more than 71 millim., and the largest has a greater radius of as much as 100 millim.; in correspondence with this the number of marginal plates may be much nearer forty than thirty. Mr. Sladen states expressly that there are no spines on the marginal plates, but distinct, though small, spinous tubercles may be developed, particularly on the inferomarginals; but their distribution is so irregular and their presence or absence seemingly so uncertain as to divest this character of any specific value at all. There is somewhat greater irregularity in the disposition of the adambulacral spines than is indicated in the original description. The groove marking the boundaries of the disk-pentagon varies a good deal in distinctness; this may be partly due to the specimens having been, unfortunately, dried; this may, further, explain why the abactinal disk-plates are not so regular in disposition, the primary embryonic plates so distinct, or the madreporite so prominent as they appear to be in the type specimen. None of these characters are, however, of value as indications of specific distinctness. As the 'Challenger' examples were dredged in 1525 fath. south-west of the Canary Isles, the locality at which Mr. Green found his specimens is one which is only probable enough.

Cribrella sanguinolenta, O. F. M.

Taken at 55 fath.

Asterias rubens, L.

Taken at 100 fath. Mr. Green justly remarks that this is a great depth for this species, and Mr. Sladen, in his recently-issued 'Challenger' Report, does not give a lower depth than 53 fath. A larger and more normal specimen was taken at 55 fath.

Brisinga coronata, G. O. Sars.

An injured specimen was brought up from 1000 fath. This depth is interesting, for though the species is known to come from still greater depths, all those reported for examples taken during the 'Porcupine' cruises are less*.

* See Sladen, Chall. Rep., Asteroid. p. 604.

III. OPHIUROIDEA.

Ophiothrix pentaphyllum, Penn.

Two large specimens from 200–315 fath., which would, I imagine, be referred to *O. Luetkeni*, Wyv. Thoms.*; I must own, however, that the variations exhibited among the better known littoral representatives of this species are so great that I cannot bring myself to look upon the specimens before me as anything more than large, well-marked individuals of this variable species.

IV. ECHINOIDEA.

Cidaris papillata, Leske.

Taken at various stations, from 150 to 315 fath.; as usual, in some localities the species was very abundantly represented. The specimens do not exhibit in any marked degree the variation to which Prof. Wyville Thomson has called attention, for they may all be said to have the spines rather long and slender than stout. In a young specimen the echination of the spines is more marked than in those which appear to be adult.

Phormosoma placenta.*Phormosoma placenta*, Wyv. Th.

The capture of this species was perhaps the greatest of Mr. Green's achievements; so far as English naturalists are concerned the disappearance of the Echinids described by Sir Wyville Thomson in the 'Philosophical Transactions' for 1874 has been a misfortune, as they have never had the opportunity of examining this form for themselves; the other specimens known to have been collected are those which were obtained by the 'Knight Errant' in the Færoe Channel †, and by the 'Blake' in American waters; the only naturalist who has, so far as can be gathered, had the opportunity of examining these specimens is Prof. Alex. Agassiz, who has chiefly occupied himself with describing the changes due to growth and discussing the affinities of these forms. Though such investigations are of interest and importance, we are still in need of that more elementary and less exciting information which consists in an adequate knowledge of the species itself

* 'Depths of the Sea,' p. 100.

† With it should be noted, dredging-apparatus provided at the expense of Sir W. Thomson; cf. Proc. Roy. Soc. Ed. xi. p. 644.

and of allied forms. The marked divergence in the statements which I now have to make with regard to *Phormosoma placenta* from those made by two brilliant and accomplished German naturalists with regard to an apparently allied species is sufficient to show this.

I should add that I have made some use of the material obtained by H.M.S. 'Challenger,' but the unique condition of some of the specimens, the disappearance of the viscera of others, and the absence of the remarkable *P. rigidum* have prevented me from making the investigation as complete as I wished.

In the interesting essay on the Echinothuriidæ *, which Dr. P. and Dr. F. Sarasin based on the beautiful form *Asthenosoma urens*, which they discovered off Ceylon, especial attention was directed to the organs of Stewart; these are of considerable size in the Ceylon species. Notwithstanding the fact that no description of these organs has been given by Thomson or Agassiz, the Doctors Sarasin ascribe to the Echinothuriidæ as one of their distinctive characters a "gewaltige Entfaltung der Stewart'schen Organe," and they say, further, "Sowohl die Cidariden als die Diadematen besitzen die Stewart'schen Organe, welche bei den Echinothuriden reich entwickelt sind, in rudimentärer Ausbildung." I was somewhat interested to discover how it was that organs so remarkably well developed had not been seen by previous observers. The first example I opened served to settle the question on the same principle as that on which Tilburina could not see the Spanish fleet; the organs of Stewart were not there to be seen. In some anxiety to bring this state of things into conformity with the very absolute statement of the Drs. Sarasin I opened another specimen; here I found the arrangement shown in Pl. XVIII. fig. 2, which is drawn of the natural size, the whole test being 110 millim. in diameter. I come to the conclusion therefore that in *Phormosoma* the organs of Stewart may be present in a rudimentary or vestigial condition, or may be absent; I have been unable to find any trace of their presence in *Phormosoma bursarium* or *P. tenue*; but as these specimens have been several years in spirit, I will not lay much stress on the apparent absence of these organs. I need not do that to show that there is a considerable difference in the anatomical characters of the two genera, differences which most of us have tacitly assumed not to exist, which, possibly, we had no reason to expect to see, but as certainly no reason not to expect.

* Ergebnisse naturw. Forsch. auf Ceylon, I. 3. Ueber die Anat. der Echinothuriden u. die Phylog. der Echinodermen.

One of the most interesting discoveries of the Drs. Sarasin was that of the muscles which divide the test into a series of compartments and appear to be the agents in the vermicular contractions of the living test; this again they have made one of the characteristics of the Echinothuriidæ, and here, again, they have unfortunately argued from the particular to the general. These "Längsmuskeln" are altogether absent from *Phormosoma*. An interesting proof of this may be easily afforded: if a *Phormosoma* be opened and water poured into the test the whole test swells up; if a quadrant of an *Asthenosoma* be laid open and water poured in the whole test does not swell up, and such a specimen if returned to spirit will be found to float with one quadrant upwards, just as though it were provided with air-tight compartments; these, of course, are the "Kästchen" of the Sarasins. I am not, however, sure that, even confining ourselves to the genus *Asthenosoma*, as at present defined, we can always speak of the longitudinal muscles as being well developed; they certainly are remarkably well developed in *Asthenosoma Grubii*, but they are very poorly so in the smaller *A. pellucidum*. With the absence of the muscle is correlated that of the Kästchen, and with that of the Kästchen the peculiar loop of intestine in each alternate compartment. I do not like to lay too much stress on the apparent absence of the organs of Stewart from *Asthenosoma Grubii* and *A. pellucidum*; delicate membranes might well be injured or collapsed in specimens all of which were collected before 1876 (that is, of course, during the cruise of H.M.S. 'Challenger'), and I am not saying they are not to be found in all species of *Asthenosoma*; I have, however, some doubt as to whether or no they are so large or so constant as they seem to be in *A. urens*.

However that may be, the condition which obtains in *Phormosoma* shows that the large size of the organs of Stewart is not a character of the Echinothuriidæ. I need not press this point further by urging that this single fact will dispose of a good deal of the speculation which made Messrs. Sarasin's essay more than usually interesting.

Six specimens were dredged at 1000 fath, five of which are in the possession of the British Museum; the colour of the test preserved in alcohol varies from lightish yellow to a distinct purplish colour; in all cases, unfortunately, the spinulation is practically destroyed.

	Diam. of test. millim.	Diam. of mouth. millim.	Diam. of apical area. millim.
A....	125	36	20
B....	110	34	18
C....	100	32	18
D....	95	24.5	15.5
E....	80	21	14.5

The specimens A and B were opened ; before this was done a small hole was made and spirit injected, so as to moderately distend the test ; the height of A was then 40 and of B 30 millim.

ECHINUS.

As will be readily supposed by those who know the difficulties always presented by a number of northern specimens of this genus, I have had to puzzle long over the large number of examples which Mr. Green collected. At this moment the matter seems to me clear enough, but I am by no means confident that if I had taken the set of specimens in a different order I should not have arrived at a different conclusion. I seem to have before me :—(1) *Echinus acutus*, (2) *Echinus microstoma*, and (3) *Echinus esculentus* ; I have had to detail at what will, I fear, be a wearisome length the doubts and difficulties I have experienced as to a fourth species which seems to me to be probably *E. elegans*.

Echinus acutus, Lamk.

First, as to the matter of the name I follow Prof. A. Agassiz (1872) in regarding *E. Flemingi* as synonymous with *E. acutus* ; Sir Wyville Thomson records *E. Flemingi*, Ball, but not *E. acutus*, as having been taken by the 'Porcupine.' Thomson gives no reason for the adoption of Ball's name, though it is clear from p. 722 of his memoir that he was acquainted with Mr. Agassiz's 'Revision ;' in the matter of nomenclature, however, these two authors are often at variance, and Thomson holds *E. acutus* over (see p. 744).

E. acutus was obtained by Mr. Green at 55, 110, 500 fath.

E. acutus certainly varies considerably ; there is one well-marked variety in which the spines are a good deal longer than usual and bright crimson at the base when dry ; for example, in a "typical example" one of the longest spines measured 37 millim., and in the variety 46 millim., both being from the same haul of the dredge. This long-spined variety was found of different sizes, the proportionately longer spines being visible even in quite moderately sized specimens.

Echinus microstoma, Wyv. Thoms.
(Pl. XIX. fig. 1.)

There is certainly among these Echini a species distinct from *E. acutus* or *E. esculentus*; it has a bright red test and that test is depressed and thin. It is a little doubtful how much stress should be laid on colour and particularly red colour in Echinoderms; depressed tests may certainly be seen in specimens of species which are not always characterized by their possession; but the thinness of these tests is quite well marked. The specific name calls attention to the characters of the mouth; but smallness and largeness are relative terms, and I give, therefore, some measurements which Wyville Thomson omitted to add to his description. I have also thought it necessary to refigure the species, for the representations offered by Thomson are by no means good, and the differences between *E. microstoma* and *E. elegans* are hardly at all indicated. A reference to figs. 8 and 9, pl. lxxviii. of Thomson's memoir and to fig. 3, Pl. XIX. of the present paper will show the difference in the form of the C-shaped spicules of these two species.

Diam. of test. millim.	Height of test. millim.	Diam. of mouth. millim.	Diam. of anus. millim.
50	25 * (50)	12 (24)	5 (10)
47	20 (42·5)	13 (27·6)	5 (10·6)
43	19·5 (45·3)	11·5 (26·7)	5 (11·6)
40	21 (52·5)	10·5 (26·2)	4·5 (11·2)

Echinus esculentus, L.

Two specimens, one from 50–66 fath., the other from 110 fath.

Both examples are somewhat compressed instead of being globose, and tend towards the "marked variety with a tall, narrow test" spoken of by Sir Wyville Thomson (*t. c.* p. 744). The lowest recorded depth for this species that I can find is 80 fath.; Prof. Agassiz gives no specific information on this point in his 'Challenger' Report.

* As no measurements have yet been given of this species, I give the absolute values; the percentage values, which are much more valuable for the purposes of comparison, are added in brackets. There is no better method for showing the range of variation. For the purposes of comparison I give the following percentage measurements of a rather young *E. acutus*, the diameter of which is 51 millim.:—height 58·8, mouth 35·3, anus 18.

Echinus elegans, D. & K.
(Pl. XIX. figs. 2 and 3.)

I refer to this species four specimens from 250 fath.; but I have had great difficulty in making up my mind about them, for the Museum is very poorly provided with examples of what Sars called an "overordentlig sjeldne Art," though a good many would seem to have been collected by the 'Porcupine.' The four examples now before me are all small, and there would be no reason to suppose that they are sexually mature were it not that Wyville Thomson * has put on record the existence of a small ("pony") race of *Echinus norvegicus*; I am quite unable to settle the question, as the specimens were all dried before being sent to me †.

I cannot see on these specimens the "beautiful vermilion bands, extending from the apex towards the ambitus on both sides of the bare median vertical line," which Prof. A. Agassiz states to be the feature by which *E. elegans* may be "recognized from its congeners" ‡; but I do not see the same bands in a beautiful and perfectly preserved specimen (62 millim. in diameter) which the Trustees have lately acquired from the Bergen Museum, and which was taken in the Hardangerfjord at a depth of 150 fath.; and they agree well enough with the diagnosis of Düben and Koren. They cannot be expected to agree very closely with the figure given by those distinguished naturalists, on account of the marked difference in size.

It often happens that a minute histological character goes a long way in settling doubtful questions of resemblance, and the fact that the spicules in the suckers of these small specimens are exactly similar to the straight-backed C-shaped spicules of the tube-feet of an undoubted *C. elegans* has done much in deciding me as to what name to apply to these specimens. I greatly regret that, though I have made several efforts, I have not yet succeeded in obtaining examples of what other workers in Echinology have called *E. elegans* §.

* 'Depths of the Sea,' p. 117.

† It often happens that one has to lament the fact that while spirit has been saved the specimens have been for some purposes lost.

‡ Rev. Ech. p. 491.

§ With a single exception of some specimens from Norway, sent me by a curator of a museum who had not a very large series, and who had so named some examples of *E. acutus*. Since the above was sent to press the Rev. Dr. Norman has, with his usual generosity, sent me a number of specimens of *Echinus* for examination. An inspection of them leads me to think that I have rightly ascribed the four specimens now under discussion to *E. elegans*.—Nov. 7, 1889.

The 'Challenger' is reported to have collected the species at "St. 46" and off Tristan d'Acunha; but, as the following measurements show, the specimens so determined by Prof. A. Agassiz are much more depressed and have a much longer periproct and a larger anus than the specimen from the Bergen Museum.

	Diam. of test.	Height of test.	Diam. of mouth.	Diam. of periproct.	Diam. of anus.
Bergen specimen ..	62	49	21	13	6
Tristan d'Acunha ..	70	35	20	20	10
St. 46	65	30	20	18	8

If other specimens diverge as widely from a fairly typical example as do those determined by Prof. Agassiz, we are a long way yet from getting either a consensus of opinion or accuracy in comparison.

I will, with the aid of Mr. Highley's pencil, do my best to let my fellow-students understand what I mean by young specimens of *E. elegans*, and I add the following measurements, as they will be of use:—

	Diam. of test.	Height of test.	Diam. of mouth.	Diam. of periproct.	Diam. of anus.
i. . .	19	8.5	7.75	5.5	3
ii. . .	19	9	7.5	6	2.5
iii. . .	15	8	5.5	..	2
iv. . .	12.5	5.5	6	..	2

The spines have the appearance of being broken at their tips; the longest I have found are on tests iii. and iv., on each of which there is a spine 12.5 millim. long. With regard to the broken look of the spines, it is to be noted that the figure illustrative of Düben and Koren's paper illustrates the same point, and that it is also to be observed in the well-preserved specimen from the Hardangerfjord already mentioned.

Spatangus purpureus, O. F. M.

Two specimens, of moderate size, from 50 to 60 fath.

Spatangus Raschi, Lovén.

A fine series from 100 to 180 fath., showing how very considerably this species varies, so much so, indeed, that one is almost inclined to suspect that it forms hybrids with *S. purpureus*. In the latter the primary spines are, as is well known, much longer, stronger, and more prominent than the

secondary or smaller spines; in *S. Raschi*, on the other hand, this difference is, typically, hardly noticeable, and in correspondence with this the tuberculation is much more uniform. In one of the specimens of *S. Raschi* now lying before me the spines are as long and as prominent as in a specimen of *S. purpureus* of nearly the same size; in another, somewhat larger, the spines are much longer than we generally find them in *S. Raschi*; but they are much more uniform in size than in either the first-named specimen or than in *S. purpureus*, and, so far, the latter could not be confounded with the more common species. Nor could the first-named, but for a different reason; it is much higher than a *S. purpureus* of the same length; but the second specimen, though some 10 millim. longer, is about 2 millim. less high, and, of course, looks much less high than its smaller companion.

With the difference in the size of the spines there is, of course, correlated a difference in the size of the tubercles which bear them; an inspection of Prof. Lovén's figure* shows that the difference is not very marked in his type specimen. I removed the spines from a specimen which, in its spinulation, most closely resembles *S. purpureus*, and I find on cleaning the test that some of the tubercles are more than ordinarily larger than the rest; the general facies of this test is, however, distinctly that of *S. Raschi*.

So, again, it may be noted that while some tests are less deep than others, others are more rounded; again, variations may be seen in the depth of the peristome. On the whole the most constant character of the deeper-water species appears to be the form of the labrum; this is always more pointed and convex than in *S. purpureus*.

We may, then, observe with regard to a number of the so-called specific characters of *S. Raschi* that they vary within very wide limits. Of the specimens collected not one would be assigned to any other species, the general facies of *S. Raschi* being maintained throughout; but on analysis the several "specific characters" are found for the most part to vary considerably.

These observations seem to me to have some bearing on the question of the utility of specific characters, for they show that we must exercise the greatest caution in the selection of the points of structure which we use as such marks. It would be preposterous to imagine any zoologist more capable than Prof. Lovén of discriminating between two species of Echinoids, and yet among the characters by which his species

* Öfv. Vet.-Akad. Förhandl. 1869, pl. xiii.

is distinguished from the commoner form he enumerates the spines, *S. purpureus* having "radiolis primariis eminentioribus colore albicante insignibus;" but the differences between the two species in this particular are much reduced when a series is examined. On the other hand, whether specific characters are useful or not, spines are certainly valuable to the individual which possesses them. As the accompanying measurements show, the form of *S. Raschi* may vary a good deal, and these variations must affect such characters as are indicated by such expressions as "ambitu fere orbiculato, dorso multo minus convexo, margine magis rotundato." This brings us to another still unsettled question:—How far are characters that vary within considerable limits to be used as specific characters? and to such a question we can well imagine different systematists giving very different answers.

Questions like these may well be raised, if the answers that are given are tentative and not dogmatic. The only moral I can definitely see is one which has been, but must again and again be, insisted on. The definitions of species are often drawn up from a few specimens, or perhaps only one; with increased knowledge of the representatives of such species our judgment as to its characters is bound to be affected by the variations which will undoubtedly present themselves—very much so when the describer has a small knowledge of the group—to some extent even when the description is by the hand of a master in his science.

Among the specimens is one which is considerably depressed and deformed; but the abnormal characters which it presents do not seem to throw any light on the characters of the species.

Measurements of Spatangus Raschi.

Percentage value of

Long. diam.	Transv. diam.	Height.
107	86	60·74
91	85·7	70·3
90	97·7	75·5

Brissopsis lyrifera, Forbes.

Two spineless specimens, of ordinary size, were taken in 5 fath.

V. HOLOTHURIOIDEA.

Holothuria tremula, Gunner.

Dredged at 100 and 315 fath. ; it was dredged from greater depths than these by the Norwegian North-Sea Expedition.

Holothuria aspera. (Pl. XVIII. fig. 3.)

Although there is but a single specimen of what I think is certainly a new species of *Holothuria*, the spicules appear to be so characteristic that there is no harm in giving a name to a form of which we shall, I hope, soon obtain a supply large enough to enable me to give a complete account of its special points.

This single specimen is a good deal contracted and the tentacles are all withdrawn. The skin has to the touch a peculiar roughness, which is no doubt due to the very dense deposit of spicules in it. Above, the skin is wrinkled, below it is smooth; on each side there is a single row of not closely packed pedicels; no other processes are to be detected. The colour of the skin is a dirty grey. The length of the body is 77 millim. and the greatest breadth 46.

The spicules are particularly difficult to isolate; their general form is well shown in fig. 3, Pl. XVIII.

The processes or arms may touch or overlie one another. As there is only one specimen I have not dissected it.

It was dredged at 1000 fath.

EXPLANATION OF THE PLATES.

PLATE XVIII.

- Fig. 1.* *Phormosoma placenta* laid open, so as to show the lantern and the parts adjacent thereto. It will be noticed that the organs of Stewart are altogether wanting. Natural size.
- Fig. 2.* The same, opened as before. s in three radii points to small projecting cæca, two of which are quite small and the third hardly more than a papilla. Natural size.
- Fig. 3.* Calcareous spicules from the skin of *Holothuria aspera*. $\times 220$.

PLATE XIX.

- Fig. 1.* *Echinus microstoma*. The specimen from which this figure was taken agrees in all essential characters with one which is referred to the same species by the Rev. Dr. Norman and which was collected by the 'Porcupine.' Natural size.
- Fig. 2.* *Echinus elegans*, small specimen. $\times 2$.
- Fig. 3.* C-shaped spicule of *Echinus elegans*. $\times 220$.
- Fig. 4.* *Astrogonium Greeni*, seen from above. $\times \frac{3}{2}$.
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**POLYZOA, HYDROZOA, SPONGES, and
RADIOLARIA.** By R. KIRKPATRICK.

a. POLYZOA.

- Membranipora pilosa*, L. Encrusting *Natica*, 315 fath.
Membranipora Flemingii, Busk. Encrusting stems of *Eudendrium rameum*, 55 fath.
Porella compressa, Sowerby. 55 fath.
Cellepora ramulosa, L. 55 fath.
Cellepora armata, Hincks. Encrusting *Eudendrium*, 55 fath.
Idmonea serpens, L. 55 fath.
Lichenopora hispida, Fleming. 55 fath.
Alcyonidium mytili, Dalyell. On *Tubularia*-stems, 55 fath.
Arachnidium simplex, Hincks. On *Chrysodomus*, 315 fath.
 This species is new to the British fauna. The type specimen is from Barents Sea, 62 fath. (v. Hincks, Ann. & Mag. Nat. Hist. (5) vi. 1880, p. 284, pl. xv. figs. 10, 11).
Triticella flava, Dalyell. Growing on *Natica*, 315 fath.
Barentsia gracilis, Sars. On *Eudendrium*, 55 fath.

b. HYDROZOA.

- Podocoryne areolata*, Alder. Growing on *Aporrhais pes-carbonis*, 150 fath.
Eudendrium rameum, Pallas. 55 fath.
Tubularia indivisa, Linn. 55 fath.
Campanularia Hincksi, Alder. 55 fath.
Lafœa dumosa, Fleming. 58 fath.
Sertularella tenella, Alder. 55 fath.

c. SPONGIIDA.

Only one sponge was obtained:—

- Aphrocallistes Bocagei*, Wright. 500 fath.

The specimen is about $3\frac{1}{2}$ inches in height, and is well preserved. Specimens were previously obtained by the 'Porcupine' expedition at Station 36, from a depth of 725 fath. As will be seen from the following list, the range of the species is very wide, having been found off Florida, Bermudas, St. Thomas W.I., S.W. Ireland, S.E. Spain, Portugal, Cape Verde Is., Ascension Island in the Atlantic, at depths varying from 420 to 1075 fath.; the species also occurs in the North Pacific, specimens having been purchased at Inoschima by Dr. Döderlein.

d. RADIOLARIA.

Orosцена Huxleyi, Haeckel ('Challenger' Report on the Radiolaria, p. 1599, pl. xii. figs. 1, 1a). Found in ooze, dredged in 1000 fath., S.W. Ireland.

Two complete spheres and a fragment of this form were sent; but none of the long branched spines, which radiate from the surface of the sphere, had been preserved. The diameter of the shells is from 1.75 to 2 millim.

The type specimen, which is in the 'Challenger' collection, was obtained from a depth of 2740 fath., west of the Canary Islands; but there has been no opportunity of comparing the specimens from S.W. Ireland with the type, as the 'Challenger' Radiolaria have not yet been sent to the Natural History Museum.

FORAMINIFERA *. By JOSEPH WRIGHT.

- Biloculina sphaera*, d'Orb. Very rare.
 — *bulloides*, d'Orb. Frequent.
 — *ringens* (Lamk.). Very large. Frequent.
 — *elongata*, d'Orb. Very rare.
 — *depressa*, d'Orb. Very large. Frequent.
 — —, var. *murrhyna*, Schw. Frequent.
 — —, var. *serrata*, Brady. Rare.
Spiroloculina tenuiseptata, Brady. Rare.
Miliolina seminulum (Linné). Frequent.
 — *oblonga* (Mont.). Very small. Very rare.
 — *Auberiana* (d'Orb.). Frequent.
 — *subrotunda* (Mont.). Very rare.
 — *agglutinans* (d'Orb.). Very rare.
Planispirina contraria (d'Orb.). Very rare.
Sigmoilina celata (Costa). Common.
Cornuspira carinata, Costa. Large. Very rare.
Orbitolites tenuissima, Carp. Rare.
Astrorhiza arenaria, Norman. Broken specimens. Very rare.
Pelosina variabilis, Brady. Frequent.
 — *rotundata*, Brady. Very rare.
Storthosphaera albida, Schulze. Very rare.
Pilulina Jeffreysi, Carp. Rare.
Pseudosphæra fusca, Schulze. Most of the specimens built round sponge-spicules. Common.

* Dredged in 1000 fath.

- Hyperammia arborescens*, Norman. Rare.
 — *elongata*, Brady. Frequent.
 — *ramosa*, Brady. Rare.
 — *vagans*, Brady. Frequent.
Marsipella elongata, Norman. Rare.
Rhabdammina abyssorum, M. Sars. Frequent.
Rheophax adunca, Brady. Rare.
 — *dentaliniformis*, Brady. Rare.
 — *distans*, Brady. Very large. Common.
Haplophragmium agglutinans (d'Orb.). Rare.
 — *canariense* (d'Orb.). Frequent.
 — *globigeriniforme*, P. & J. Rare.
 — *latidorsatum* (Born.). Common.
Placopsilina vesicularis, Brady. Very rare.
 — *cenomana* (d'Orb.). Very rare.
Thurammia papillata, Brady. Frequent.
Hormosina globulifera, Brady. Rare.
Ammodiscus charoides, J. & P. Frequent.
Trochammia pauciloculata, Brady. Common.
 — *Robertsoni*, Brady. Frequent.
 — *nitida*, Brady? Rare.
Cyclammia cancellata, Brady. Common.
Webbina clavata, J. & P. Frequent.
Textularia agglutinans, d'Orb. Rare.
 — *aspera*, Brady. Rare.
Verneuilina pygmæa, Eggar. Frequent.
Gaudryina rugosa, d'Orb. Frequent.
 — *pupoides*, d'Orb. Very common.
 — *filiformis*, Berthelin. Frequent.
Bulimina elegans, var. *exilis*, Brady. Rare.
 — *inflata*, Seg. Very common.
 — *ovata*, d'Orb. Very rare.
 — *pyrula*, d'Orb. Very rare.
 — *subteres*, Brady. Very rare.
 — *fusiformis*, Will. Very rare.
Virgulina subsquamosa, Eggar. Rare.
 — *Schreibersiana*, Czjek. Rare.
Bolivina punctata, d'Orb. Frequent.
 — *textilarioides*, Rss. Rare.
 — *dilatata*, Rss. Rare.
 — *difformis*, Will. Rare.
Cassidulina levigata, d'Orb. Common.
 — *Bradyi*, Norman. Very rare.
Milletia Earlandi, J. Wright, MS. Very rare.
Lagena globosa, Mont. Rare.
 — *apiculata* (Rss.). Rare.
 — *gracillima* (Seg.). Rare.
 — *hispida*, Rss. Very rare.
 — *distoma*, P. & J. Frequent.
 — *sulcata* (W. & J.). Very rare.

- Lagena striatopunctata*, P. & J.? Very rare.
 — *hexagona* (Will.). Rare.
 — *levigata*, Rss. Very rare.
 — *staphyllearia* (Schw.). Rare.
 — *marginata* (W. & B.). Frequent.
 — *lagenoides* (Will.). Very rare.
Nodosaria (*Glandulina*) *levigata*, d'Orb. Rare.
 — (*G.*) *rotundata* (Rss.). Rare.
 — *communis*, d'Orb. Rare.
 — *soluta*, Rss. Frequent.
 — *scalaris*, Batsch. Very small. Rare.
 — *raphanus* (Linné). Rare.
 — *obliqua* (Linné). Rare.
Vaginulina legumen (Linné). Rare.
 — *spinigera*, Brady. Rare.
Rhabdlogonium tricarinatum (d'Orb.). Very rare.
Cristellaria tenuis, Born. One small specimen.
 — *obtusata*, var. *subalata*, Brady. Frequent.
 — *variabilis*, Rss. Very rare.
 — *crepidula*, F. & M. Not typical. Very rare.
 — *cultrata*, Montf. Very rare.
Polymorphina, sp. Very rare.
Uvigerina pygmaea, d'Orb. Frequent.
 — *aculeata*, d'Orb. Frequent.
 — *angulosa*, Will. Rare.
Globigerina bulloides, d'Orb. Very common.
 — *inflata*, d'Orb. Very common.
 — *rubra*, d'Orb. Rare.
 — *æquilateralis*, Brady. Common.
Orbulina universa, d'Orb. Very common.
Pullenia quinqueloba, Rss. Common.
 — *spheroides*, d'Orb. Rare.
Sphaeroidina bulloides, d'Orb. Rare.
Discorbina Bertheloti (d'Orb.). Rare.
 — *nitida* (Will.). Rare.
Truncatulina lobatula, W. & J. Rare.
 — *Wuellerstorfi* (Schw.). Common.
 — *Ungeriana* (d'Orb.). Very common.
Pulvinulina canariensis (d'Orb.). Very common.
 — *patagonica* (d'Orb.). Very common.
 — *Micheliniana* (d'Orb.). Very common.
 — *Karsteni* (Rss.). Very small. Rare.
 — *elegans*, d'Orb. Very rare.
Rotalia orbicularis, d'Orb. Frequent.
 — *Soldanii*, d'Orb. Frequent.
Nonionina umbilicatula (Mont.). Rare.
 — *turgida*, Will. Frequent.